2014

SEX IN THE SUWANNEE THE SECRETIVE LOVE LIFE OF GULF STURGEONS

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Mid-February in the Gulf of Mexico and a timeless ritual is about to repeat itself for perhaps the millionth time. Some mysterious signal, possibly increasing day length, flips an internal switch, feeding stops, and the homeward migration begins for the Gulf Sturgeon (*Acipenser oxyrinchus desotoi*). From far flung places along the Gulf Coast, Gulf Sturgeons start heading back to their natal rivers – they know the way instinctively. Maybe they seek out the special chemical taste of their home river, imprinted at hatching. Or perhaps the ultrasensitive electric organs decorating the underside of the snout can follow the map of the earth's magnetic field. Either way, time to make a beeline for the welcoming waters of the Suwannee River, or maybe the Apalachicola, Choctawhatchee, or one of four other spawning rivers. Some of the adults are on a special mission – time to spawn, time to perpetuate the species. Mature males form the first wave in this homebound marathon, eager to get to the spawning grounds, eager to be the first to greet ready females with a series of sharp clicking sounds. Only spawning once each three years, females laden with large black eggs demure, taking their time, arriving in mid to late March, a month behind the early males. But most sturgeons, juveniles and immature adults not ready to spawn, are simply heading home. Not prompted by the spawning urge, they are just following the ancient annual cycle of intense winter feeding in the Gulf, followed by several months of fasting and R&R in the river.

By mid-April, the entire population will be back in the river, no longer easy prey for sharks, no longer having to pump salt out of their blood to deal with a foreign marine environment. Sturgeons may venture into the sea to feed, but they are freshwater fishes. Freshwater rivers are their natural home, a place to comfortably lull away summer, sustained by stored energy. Not feeding for several months may seem odd to humans, but it is not unusual for fishes and other cold-blooded animals. Sturgeons can really pack on the pounds when feeding in marine waters, increasing their weight by 20-40 percent in just a few months. Getting big fast is important for a slow-moving bottom feeder. Few predators can attack a 50 or 100-pound sturgeon. Getting big also means being able to store a lot of energy as muscle and fat, energy that can be utilized later on. This is particularly important for adult females. It takes a great deal of energy, and three years of feeding, to fill the abdomen with 20-30 pounds of mature eggs.

Stealthy and secretive by nature, Gulf Sturgeons enter the Suwannee River mainly at night. They swim close to the bottom, avoiding the stronger surface currents, not jumping during the immigration. Over a period of 4-6 weeks, more than 15,000 sturgeons will pass totally unnoticed through the river mouth at East Pass. Large numbers will blitz into the river, sometimes singly, sometimes in groups, particularly during those dark nights of the new moon. Those early males will not tarry, driven by a powerful urge to spawn. Swimming continuously, the 4-5 foot long males will make the 125-mile ascent to the upper river in 2-3 days, and then hang out just a few miles below the gravel beds awaiting

Two-month-old juvenile Gulf Sturgeon in fisheries biologist's hand. Escambia-Conecuh River. (Alabama Division of Wildlife and Freshwater Fishes, Steve Rider, biologist)

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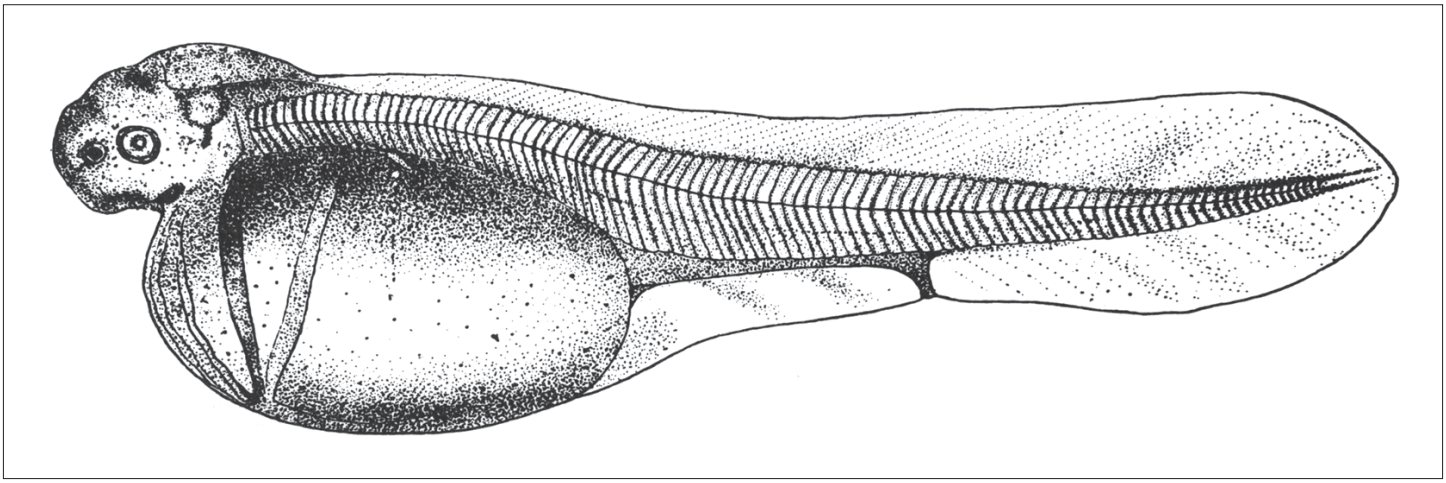
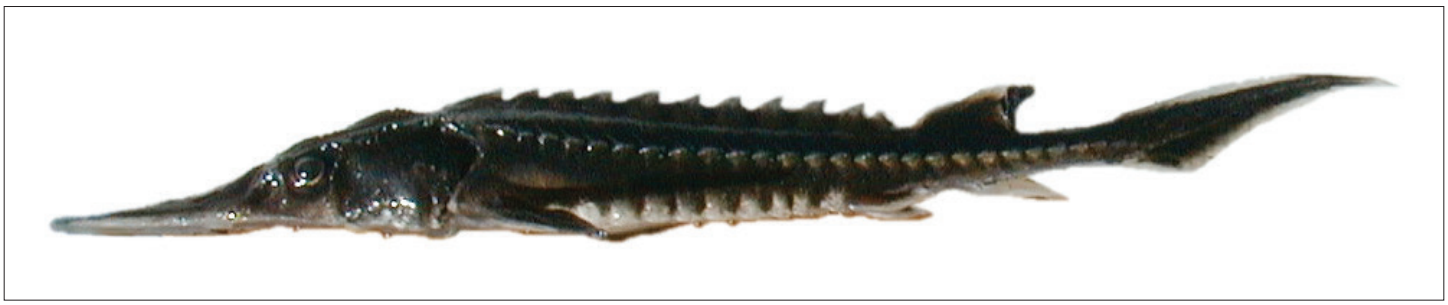


Newly hatched yolksac larva of Atlantic Sturgeon (very closely related to the Gulf Sturgeon, so early larva is virtually identical). Source: Ryder, J.A. 1890. The sturgeons and sturgeon industries of the Eastern Coast of the United States with an account of experiments bearing upon sturgeon culture. Bulletin of the U.S. Fish Commission for 1888 8(8):213-328, plates 38-59.

the arrival of the much larger females. Males probably advertise their presence by making a series of evenly-spaced sharp clicking sounds. Females ready to spawn, their egg-laden bellies plump and turgid, are more deliberate, often resting their 6-8 foot long bodies in big eddies near the river mouth for several days before deciding to swim upstream. Some males, perhaps older, more experienced individuals, accompany the females. Indeed, some male and female pairs remain together for life. Sturgeon relationships are complex with a variety of lifestyle options.

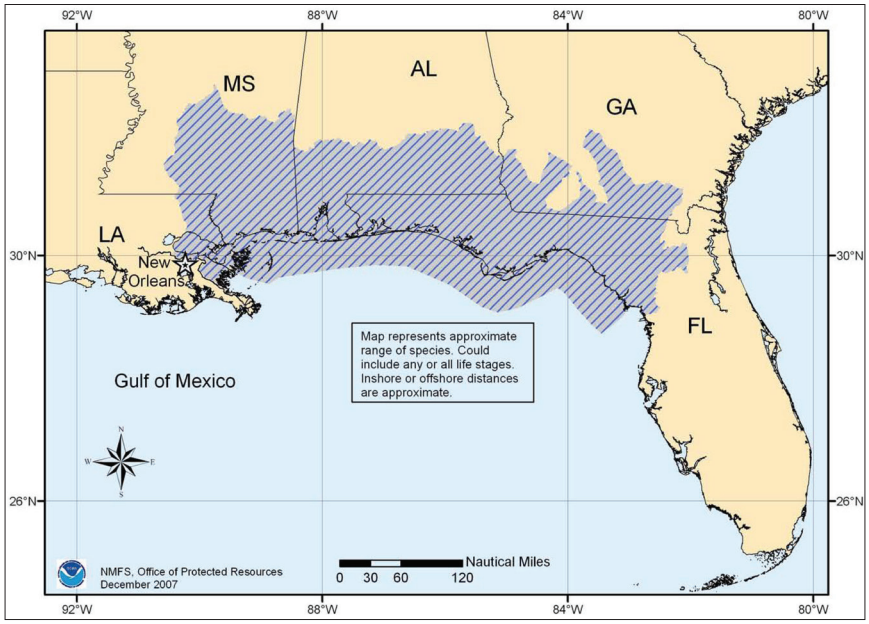
Late in March or early in April, all ripe males and females will mass in the upper river, just below the spawning grounds. When river flow, water temperature, and water chemistry are just right, sturgeons ready to spawn will make short upstream forays to the spawning grounds, areas of gravel, each much smaller than a football field. Spawning in the swift, dark, tannic waters of the Suwannee River is a secretive affair, the action taking place in the wee hours of the night, probably around 2–4 AM. No one has ever witnessed Gulf sturgeons in the act of spawning. But, in other less secretive sturgeon species, several males surround each ready female, rudely and insistently nosing and nudging her rough sandpaper flanks and sharp scutes, trying to prompt her as she holds a position on the gravel. Gulf sturgeon males pay a price for their amorous advances, ending up with torn, bloody snouts. But the ploy works, inducing the female (belly red and abraded) to release streams of BB-sized eggs that immediately adhere to golf-ball sized gravel. Simultaneously, the males release clouds of semen, billions of sperm, enveloping the eggs in a milky-white shroud. In the Lake Sturgeon, northern cousin of the Gulf Sturgeon, males emit a long series of low drumming, thumping sounds as they quiver and release jets of milt (the thrill of victory?). Maybe Gulf Sturgeon males do the same—no one really knows. We do know that spawning begins suddenly and ends quickly. Having dropped as many as half a million shiny black eggs in 1-2 hours, the female is done for the next three years. Her work completed, abdomen shrunken between prominent stretch marks, she drops back downstream, settling into one of several deep holding and resting areas in the middle river. Males are not done. Over the course of 2–3 weeks they may spawn with several females on several different nights. Eventually, however, no more females arrive, water conditions change, and the season is over. Then, the males also drop downstream, joining the rest of the population in the spring-to-fall holding areas, where all make their presence known with spectacular leaps in the summertime.

Sturgeon sperm are tipped with an anchoring device called



Two-month-old, 3-inch young-of-year juvenile Gulf Sturgeon, Suwannee River. (USGS photo by Ken Sulak)

an acrosome. Hundreds of sperm will attach to each egg, but only one will penetrate the egg's micropyle (a small opening through the egg membrane) and begin the magic of sexual fertilization. When sperm and egg are conjoined, and the genetic blueprint is complete, a new baby sturgeon begins to develop. After three days, and millions of cell divisions, a half-inch long tadpole-shaped larvae pops open a small circular door in the egg shell, and wiggles out into a raw, dangerous world. This helpless imp cannot swim or feed, but it can wiggle and squirm. And it does so, instinctively avoiding light, rapidly working its way under bits of gravel, seeking the safety of darkness, hiding from predators. Drawing nourishment from its large yolksac for five days, beating the odds against survival, a miniature sturgeon finally emerges from the gravel bed. Miraculously, it is now equipped with eyes, mouth, large teeth, barbels, fins, and a stomach. Only a lucky few make it to this stage. Typically, 99 percent of the eggs and hatchling larvae perish, consumed by predators. But in the process, sturgeons enrich the nutrient-poor upper river with a few thousand pounds of eggs each spring, high-energy food for many aquatic species from crayfish to catfish. For those lucky larval sturgeon survivors, it is now time to feed—look out aquatic insect larvae, the sturgeons are coming! Featured on the baby sturgeon menu are the tiny aquatic stages of midges and gnats, sometimes including those biting no-see-um gnats (hooray for sturgeons!). Larval Gulf Sturgeons themselves are tiny, voracious buzz-bombs, tooling and bumping inconspicuously along the sandy river bottom, then swimming up into open water, spinning, whirring, and somersaulting, spotting and attacking tiny plankton animals. Then diving back to the safety of the sand. As they work their way downstream, larval sturgeons grow rapidly, turning from dull gray to jet black, losing their teeth, and beginning to feed like adults: belly to the bottom, feeling out scarce prey with their long sensitive barbels. One tasty touch and, with lightning-fast speed, out shoots that remarkably long, tube-shaped mouth, sucking up insect larvae, worms, and tiny shrimp-like animals. Around age 3–4 months they change color, adopting the brown topside and cream-white underbelly of the adult. Of the millions of eggs spawned in a single year, eight months later only about 500 super-thin 12-inch juveniles will survive to join the ranks of larger sturgeons at the river mouth in late January. Having eked out a meager existence in the river, these new recruits will now chow down in major fashion, fattening up quickly, soon looking like miniature blimps. They will feast on a rich banquet of tiny crustaceans worms, and midge larvae that thrive in the Suwannee estuary, including lots more of those pesky no-see-um larvae. Who says Gulf Sturgeons are ancient relics with no purpose or value? *"To everything there is a season, and a time to every purpose under heaven."** How many billions of biting no-see-ums must meet their demise when those blessed sturgeons show up to feed in October?



Gulf Sturgeon range (NOAA/NMFS: http://www.nmfs.noaa.gov/pr/species/fish/gulfsturgeon.htm)

For a yearling Gulf Sturgeon, surviving that treacherous first year in the river is a milestone. But, that is only the beginning of a tortuous journey. If that little sturgeon is a male, it will take eight years to become an adult, if a female twelve years. Most will not make it, succumbing to the many hazards of life before having a chance to repeat that timeless ritual, to close the ancient circle of life. Of the females that do reach adulthood, few will spawn more than 3–4 times. Among Gulf Sturgeons, 25 is a ripe old age, with a rare few surviving to their mid-30s. As long as we can keep our coastal estuaries healthy, our rivers flowing, and provide free access to upper river spawning grounds, those magnificent sturgeons will continue their ancient cycle, and continue to awe new generations with their wild leaps in mid-summer.

* Ecclesiastes 3:1